Fertilizer Placement Affects Weed Growth in Container Production

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Nature of Work: Weed control in container production is achieved primarily through use of preemergence herbicides, along with some hand-weeding. Since most herbicide programs are not 100% effective, growers are continually evaluating new strategies to improve weed control in their nurseries. Fertilizer placement has been shown to affect weed growth in several agronomic cropping systems. Banding of fertilizers below the soil surface in wheat (*Triticum aestivum)* (1) and peanut (*Arachis hypogaea*) (2) reduced weed growth compared to broadcast surface applications. However, the potential impact of fertilizer placement on weeds in container crops has not been investigated. Dibble fertilization is when fertilizer is placed directly beneath the liner being transplanted.

Pinebark is the primary component of soilless plant growth substrates used in Southerastern U.S. nursery crop container production. Pinebark substrates are inherently low in cation exchange capacity and available nutrients (3). Thus, without a fertilizer source, weed seedling establishment and growth may be limited in pinebark substrates. Fertilizer placement (topdressed or dibbled) should affect the level of available nutrients on the container surface, thus affecting weed germination and subsequent growth. Therefore the objective of this research was to determine the effect of fertilizer placement on prostrate spurge germination and growth in container crops. Experiments were conducted at Truck Crops Branch Experiment Station in Crystal Springs, MS, and the Auburn University Ornamental Horticulture Research Center, Mobile, AL.

Experiment 1: At the Truck Crops Branch Experiment Station in Crystal Springs, MS, uniform one gallon wax leaf ligustrum were potted on May 24, 2002, in 7 gallon containers using an 8:1 (v:v) pinebark:sand medium amended per m^3 (yd^3) with 2.97 kg (5 lb) of dolomitic limestone and 0.9 kg (1.5 lb) of Micromax (The Scotts Co.) micronutrients. Polyon (Purcell Technologies Inc.) 17-5-11 was applied at 180 g (5.9 oz) per container either topdressed or dibbled. Plants were placed in full sun under overhead irrigation. Thirty DAP one half of the containers were seeded with 20 prostrate spurge seed. Experimental design was a randomized complete block with eight single plant replicates. Data collected were initial plant growth indices [(height + width + width) ÷3], percent weed coverage (PWC) and weed count (number of weeds per pot) at 60, 90, and 120 days after potting (DAP). Weed shoot dry weight (SDW) and ligustrum growth indices were measured at 120 DAP.

*Experiment 2: Experiment t*wo was conducted at the Auburn University Ornamental Horticulture Research Center, Mobile, AL. Methods were the same except the potting substrate was 3:1 (v:v) pinebark:peat amended per m^3 (yd^3) with 3.56 kg (6 lb) dolomitic limestone, 1.19 kg (2 lb) gypsum and 0.9 kg (1.5 lb) Micromax micronutrients.

Results and Discussion: *Experiment 1.* There were no interactions between fertilizer placement and prostrate spurge seeding. By 90 DAP there were no differences in prostrate spurge count or PWC, whether over-seeded or not (Table 1). This was most likely due to the high weed pressure in and around the study site. At 120 DAP ligustrum in seeded containers were statistically larger than those in non-seeded containers; however, this difference was not noticeable and would not be considered a marketable difference. By 90 DAP prostrate spurge count and PWC were 230 to 423% greater, respectively, for topdressed containers, compared to dibbled containers. At 120 DAP SFW was 313% greater for topdressed containers, compared to dibbled containers. There was no difference in final plant growth index between fertilizer placement methods.

Experiment 2: There were no interactions between fertilizer placement and prostrate spurge seeding. By 90 DAP there was no difference in PWC regardless of whether containers were over-seeded or not (Table 2). At 120 DAP weed count and SFW were 121 and 269% greater in topdressed containers, compared to dibbled containers. At 120 DAP seeded containers had a SDW 269% greater than non-seeded containers. By 90 DAP PWC was 111% greater among containers which were topdressed compared to dibbled containers. Analysis of the data indicated ligustrum in topdressed containers were larger than those in dibbled containers; however, these differences were not considered economically important.

Dibbling fertilizer minimizes the amount of nitrogen, phosphorus and potassium available at or near the container surface where weeds germinate. Small seeded weeds like prostrate spurge with limited nutrient reserves would have difficulty obtaining needed nutrients in dibbled containers. It is likely that nutrient deficiencies of spurge seedlings resulted in the differences in prostrate spurge weight in the containers where dibbled fertilizer was used.

In conclusion, data herein suggest that dibbling fertilizer results in reduced prostrate spurge growth when compared to top-dressed fertilizer applications. Results were similar in tests conducted at two locations. Dibbling fertilizers is a cultural practice that can be incorporated into most nursery production systems to reduce weed pressure resulting in less hand-weeding, less competition to the nursery crop and possibly fewer herbicide applications.

Significance to the Nursery Industry: Container growers rely heavily on preemergence herbicides and hand labor for weed control. Even with a good preemergence herbicide weed control program, less than 100% control is obtained. Some growers of large container plants rely only on hand-weeding. Data herein indicate fertilizer placement influences weed control. Dibbling fertilizers (placement of the fertilizer below the liner roots immediately prior to potting) reduced prostrate spurge seedling establishment and reduced

subsequent spurge growth, compared to topdressing fertilizers. Dibbling fertilizer reduced weed growth, compared to topdressing fertilizer, and resulted in similar crop shoot growth. Understanding how cultural practices, like fertilizer placement affect weed control will help growers better manage their crops and weed control program. These data provide growers another non-chemical option when developing weed control strategies for container-grown nursery crops.

Literature Cited:

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Table 1. Effect of fertilizer placement and over-seeding on spurge control in 7 gallon containers (Experiment 1).

	Ligustrum	Prostrate Spurge							Ligustrum
	GI[y]	Count	% Coverage	Count	% Coverage	Count	% Coverage	Weight[z]	GI
Fertilizer Placement	0 DAP[x]	60 DAP	60 DAP	90 DAP	90 DAP	120 DAP	120 DAP	120 DAP	120 DAP
Topdressed	60.1 a[w]	0.9 a	2.8 a	6.8 a	28.1 a	17.1 a	58.1 a	18.6 a	111.3 a
Dibbled	61.9 a	0.4 a	1.9 a	1.3 b	8.5 b	0.6 b	8.6 b	4.5 b	110.8 a
Seed Source									
Seeded	60.9 a	0.9 a	3.4 a	4.1 a	21.4 a	9.6 a	35.9 a	11.9 a	115.1 a
Non-Seeded	61.0 a	0.4 a	1.3 b	3.9 a	15.3 a	8.2 a	30.8 a	11.2 a	107.1 b

[z]Spurge dry weight in grams.

[y]Ligustrum growth index (cm) = (height + width + width)/3.

[x]Days after potting.

[w]Means(within a column and for each factor) with different letters are significantly different, according to Duncan's Multiple Range Test (a = 0.05).

Table 2. Effect of fertilizer placement and over-seeding on spurge control in 7 gallon containers (Experiment 2).

	Ligustrum	Prostrate Spurge					Ligustrum
	GI[y]	Count	Count	% Coverage	Count	Weight[z]	GI
Fertilizer Placement	0 DAP[x]	60 DAP	90 DAP	90 DAP	120 DAP	120 DAP	120 DAP
Topdressed	56.0 a[w]	2.9 a	3.6 a	42.3 a	7.1 a	21.9 a	95.6 a
Dibbled	54.9 a	2.1 a	3.7 a	20.0 b	5.4 b	9.9 b	90.1 b
Seed Source							
Seeded	55.6 a	4.0 a	5.1 a	37.2 a	7.6 a	25.1 a	93.7 a
Non-Seeded	55.3 a	0.9 b	2.3 b	25.1 a	4.9 a	6.8 b	92.1 a

[z]Spurge dry weight in grams.

[y]Ligustrum growth index (cm) = (height + width + width)/3.

[x]Days after potting.

[w]Means(within a column and for each factor) with different letters are significantly different, according to Duncan's Multiple Range Test (a = 0.05).